# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/077,849 | 02/20/2002 | Babak Hassibi | 29250-000636 | 3140 |

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| EXAMINER |
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| ART UNIT | PAPER NUMBER |
|---|---|
| 2611 | |

DATE MAILED: 03/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| | | Application No. | Applicant(s) |
|---|---|---|---|
| **Office Action Summary** | | 10/077,849 | HASSIBI ET AL. |
| | | Examiner | Art Unit | |
| | | Lawrence B. Williams | 2638 | |

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on *20 February 2002*.

2a) ☐ This action is **FINAL.**    2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) *1-34* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-34* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *20 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

## DETAILED ACTION

### *Specification*

1.      The lengthy specification has not been checked to the extent necessary to determine the

presence of all possible minor errors.  Applicant's cooperation is requested in correcting any

errors of which applicant may become aware in the specification.

### *Claim Objections*

2.      Claim 7 is objected to because of the following informalities:  Examiner suggests

applicant define both variables, Q and M.

3.      Claim 9 is objected to because of the following informalities:  Examiner suggests

applicant replace "the memories" with "memories".  Examiner also suggests applicant replace

"the transmitter with "a transmitter" in line 2.

4.      Claim 12 is objected to because of the following informalities:  Examiner suggests

applicant replace "the memories" with "memories".  Examiner also suggests applicant replace

"the transmitter with "a transmitter" in line 2.

5.      Claim 18 is objected to because of the following informalities:  Examiner suggests

applicant define both variables, Q and M.

6.      Claim 21 is objected to because of the following informalities: Examiner suggests

applicant define both variables, Q and M.

Appropriate correction is required.


## *Claim Rejections - 35 USC § 112*

7.      The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

8.      Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for

failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention. Regarding claim 1, the phrase "based on" renders the claim(s) indefinite because

the claim(s) include(s) elements not actually disclosed (those encompassed by "based on"),

thereby rendering the scope of the claim(s) unascertainable.  See MPEP § 2173.05(d).

Accordingly, the claims have not been further treated on the merits.


9.      Claim 5 is rejected under 35 U.S.C. 112, second paragraph.  Claim 5 recites the limitation

"said set of data matrices" in line 1.  There is insufficient antecedent basis for this limitation in

the claim.


10.      Claim 9 is rejected under 35 U.S.C. 112, second paragraph.  Claim 9 recites the limitation

"said data" in line 2.  There is insufficient antecedent basis for this limitation in the claim.

Examiner suggests applicant use "bits of data" instead.

11.     Claim 11 is rejected under 35 U.S.C. 112, second paragraph. Claim 11 recites the limitation "said predetermined set of values, known as A" in lines 1- 2. There is insufficient antecedent basis for this limitation in the claim.

12.     Claim 12 is rejected under 35 U.S.C. 112, second paragraph. Claim 12 recites the limitation "said data" in line 2. There is insufficient antecedent basis for this limitation in the claim. Examiner suggests applicant use "bits of data" instead.

13.     Claim 13 is rejected under 35 U.S.C. 112, second paragraph. Claim 13 recites the limitation "said step of determining said transmission matrix data" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. Claim 13 also recites the limitation "said CD code" in line 5. There is insufficient antecedent basis for this limitation in the claim. Claim 13 also recites the limitation "the previous transmission matrix" in line 6. There is insufficient antecedent basis for this limitation in the claim.

14.     Claims 18-20 are rejected under 35 U.S.C. 112, second paragraph. Claim 18 recites the limitations "the presently transmitted matrix of data" and "the previously-transmitted matrix of data" in lines 8 and 9, respectively. There is insufficient antecedent basis for these limitations in the claim.

## Claim Rejections - 35 USC § 101

15.     35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

16.     Claims 21-23, 32 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 21 consists solely of a mathematical equation without any claimed practical application, while claim 32 claims " processor to perform the method of claim 21" without any claimed practical application.

In practical terms, claims define nonstatutory processes if they:
   – consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
   – simply manipulate abstract ideas, e.g., a bid (*Schrader*, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (*Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

17.     Claims 24-26, 34 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 24 consists solely of a mathematical equation without any claimed practical application, while claim 34 claims " processor to perform the method of claim 24" without any claimed practical application.

In practical terms, claims define nonstatutory processes if they:
   – consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or
   – simply manipulate abstract ideas, e.g., a bid (*Schrader*, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (*Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

18.     Claim 27 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant's claim 27 cites "an apparatus operable to perform the

method of claim 1". Applicant's disclosure does not give a clear and distinct description of the claimed apparatus but instead is described very broadly in paragraph [0206], which could possibly include non-statutory subject matter, ie, software. Examiner suggests applicant describe the apparatus according to the sixth paragraph of 35 U. S. C. 112.

19.    Claim 29 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant's claim 29 cites "an apparatus operable to perform the method of claim 14". Applicant's disclosure does not give a clear and distinct description of the claimed apparatus but instead is described very broadly in paragraph [0206], which could possibly include non-statutory subject matter, ie, software. Examiner suggests applicant describe the apparatus according to the sixth paragraph of 35 U. S. C. 112.

20.    Claim 31 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant's claim 31 cites "an apparatus operable to perform the method of claim 21". Applicant's disclosure does not give a clear and distinct description of the claimed apparatus but instead is described very broadly in paragraph [0206], which could possibly include non-statutory subject matter, ie, software. Examiner suggests applicant describe the apparatus according to the sixth paragraph of 35 U. S. C. 112.

21.    Claim 33 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant's claim 33 cites "an apparatus operable to perform the method of claim 24". Applicant's disclosure does not give a clear and distinct description of the

claimed apparatus but instead is described very broadly in paragraph [0206], which could

possibly include non-statutory subject matter, ie, software. Examiner suggests applicant describe

the apparatus according to the sixth paragraph of 35 U. S. C. 112.

*Claim Rejections - 35 USC § 102*

22.    The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

23.    Claims 1-6, 13-17, 27, 29 are rejected under 35 U.S.C. 102(e) as being anticipated by

Hochwald et al. (US Patent 6,724,848 B1).

(1) With regard to claim 1, Hochwald et al. discloses a method of wireless differential

communication, the method comprising: generating a plurality of baseband signals based on

Cayley-encoded input data (abstract; col. 5, line 27-col. 6, line 47); modulating said baseband

signals on a carrier to form carrier-level signals (cool. 3, lines 42-43); and transmitting said

carrier-level signals from at least one antenna (col. 3, lines 43-45).

(2) With regard to claim 2, Hochwald et al. also discloses wherein each baseband signal

is also based on a previous baseband signal that corresponds to a previously-transmitted carrier-

level signal (col. 3, lines 37-40).

(3) With regard to claim 3, Hochwald et al. also discloses wherein the transmitting step transmits from a multiple antenna array; each baseband signal includes one or more sequences, in time, of complex numbers, each sequence to be transmitted from a respective antenna of said multiple antenna array, and each baseband signal is representable as a transmission matrix in which each column corresponds to one of said sequences and represents a respective antenna and in which each row represents a respective time segment (col. 3, lines 30-37).

(4) With regard to claim 4, Hochwald et al. also discloses wherein said generating step generates each transmission matrix based upon said input data and a previous transmission matrix representing previously transmitted baseband signals (col. 3, lines 38-40).

(5) With regard to claim 5, Hochwald et al. also discloses wherein the set of data matrices is a set from a plurality of sets providing a highest transmission quality out of said plurality of sets (col. 15, lines 65-67).

(6) With regard to claim 6, Hochwald et al. also discloses wherein, for a total number of bits of data to be transmitted, said generating step includes: breaking said total number of bits into same-sized chunks; mapping each of said chunks to take a value from a predetermined set of real values to obtain a scalar set; determining a Cayley-Differential ("CD") code based upon said scalar set; and determining said transmission matrix based on said CD code (col. 5, line 28- col. 6, line 47).

(7) With regard to claim 13, Hochwald et al. also discloses wherein said step of determining said transmission matrix includes calculating said transmission matrix, $S_\tau$, according to the following equation: $S_\tau = V_{z_\tau} S_{\tau-1}$ where $V_{z_\tau}$ is generated in part according to said CD code and $S_{\tau-1}$ represents the previous transmission matrix (col. 6, lines 34-44).

(8) With regard to claim 14, Hochwald et al. also discloses a method of wireless

differential communication, the method comprising; receiving receive carrier-level signals, each

of which is formed from at least one transmit carrier-level signal transmitted from at least one

transmitter antenna passing through a channel, using at least one receiver antenna; demodulating

said receive carrier-level signals to recover a plurality of Cayley-encoded receive baseband

signals, and processing said receive baseband signals to obtain data represented thereby (col. 3,

lines 46-51; 58-60).

(9) With regard to claim 15, Hochwald et al. also discloses wherein each receive

baseband signal depends on said data as encoded therein and a previously-received receive

baseband signal that corresponds to a previously-transmitted carrier-level signal (col. 3, lines 56-

58).

(10) With regard to claim 16, Hochwald et al. also discloses wherein each receive

baseband signal includes one or more receive sequences, in time, of complex numbers; and

wherein each receive baseband signal is representable as a reception matrix in which each

column corresponds to one of said receive sequences and represents a respective receiver

antenna and in which each row represents a respective time segment (col. 3, lines 51-56).

(11) With regard to claim 17, Hochwald et al. also discloses wherein said transmit

carrier-level signals were formed from a plurality of transmit baseband signals, each transmit

baseband signal including one or more transmit sequences, in time, of complex numbers, each

transmit sequence having been transmitted from a respective antenna of a multiple antenna array,

each transmit baseband signal being representable as a transmission matrix in which each

column corresponds to one of said transmit sequences and represents a respective transmit

antenna and in which each row represents a respective time segment, each transmission matrix

being based on a transmission matrix representing a previously transmitted transmit baseband

signal and input data (col. 3, lines 31-45).

(12) With regard to claim 27, Hochwald et al. teaches the method of claim 1. Thus it

would be inherent that Hochwald et al. method would also include some type of apparatus for

performing the disclosed method.

(13) With regard to claim 29, Hochwald et al. teaches the method of claim 14. Thus it

would be inherent that Hochwald et al. method would also include some type of apparatus for

performing the disclosed method.

### *Claim Rejections - 35 USC § 103*

24.     The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

25.     Claims 28, 30 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative,

under 35 U.S.C. 103(a) as obvious over Hochwald et al. (US Patent 6,724,842 B1).

(1) With regard to claim 28, though Hochwald et al. does not explicitly teach a computer-

readable medium having code portions embodied thereon that, when read by a processor, cause

said processor to perform the method of claim 1, methods or processes implemented by

computers or processors are well known to in the art. One of ordinary skill in the art would have

been motivated to implement the method by computer or processor for reliability. Thus the claim does not constitute patentability.

(2) With regard to claim 30, though Hochwald et al. does not explicitly teach a computer-readable medium having code portions embodied thereon that, when read by a processor, cause said processor to perform the method of claim 1, methods or processes implemented by computers or processors are well known to in the art. One of ordinary skill in the art would have been motivated to implement the method by computer or processor for reliability. Thus the claim does not constitute patentability.

## *Conclusion*

26.    The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Baxter et al. discloses in US 2005/0105644 A1 Blind Signal Separation.

b.) Marzetta discloses in US 2004/0228271 A1 Frequency-Division Multiplexing System And Method For Communication Having Enhanced Reliability In Fading Environments.

c.) Hochwald et al. discloses in US 6,724,824 B1 Method For Wireless Differential Communication Using Multiple Antennas.

d.) Hassibi et al. discloses in US Patent 6,801,579 B1 Method And Wireless Communication Using Unitary Space-Time Signal Constellations.

27.     Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037.

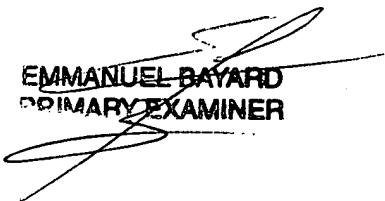The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Lawrence B. Williams

lbw
March 11, 2006

EMMANUEL BAYARD
PRIMARY EXAMINER